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POLYESTER TEXTILE ARTICLE
[Poriesuteru ori-ami-mono]

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FOREIGN TITLE	[54A]:	Poriesuteru Ori-ami-mono

Claims /2*

1. A polyester textile article, being a textile article comprising a polyester fiber, characterized by the fact that a hollow fiber that satisfies (1)-(3) below is included so as to constitute 30% by weight or more of a textile article.

(1) The maximum hollowness rate is 40% or less, and the difference between the maximum hollowness rate and the minimum hollowness rate is 7% or more.

(2) The average degree of difference in fiber cross-section is 1.5 or more, and is randomly distributed.

(3) Grooves are formed on the fiber surface.

2. The polyester textile article according to Claim 1, characterized by the facts that the grooves formed on the fiber surface are filamentous grooves, and the ratio of groove length to groove width is 5 or more.

3. The polyester textile article according to 1 claim, either Claim 1 or Claim 2, characterized by the fact that the grooves formed on the fiber surface are lateral grooves perpendicular to the fiber axis.

4. The polyester textile article according to any of Claims 1-3, characterized by the fact that the hollow fiber is a core-sheath type composite hollow fiber.

5. The polyester textile article according to any of Claims 1-4, characterized by the fact that the frequency of grooves formed on the surface of a hollow fiber is 1 groove/$(\mu m)^2$ or more and 5 grooves/$(\mu m)^2$ or less.

* [Numbers in right margin indicate pagination of the original text.]

Detailed explanation of the invention

[0001]

Industrial application field

The present invention pertains to a textile article; more specifically, it pertains to a textile article for which the hollowness ratio and hollow sector difference degree are randomly distributed for at least part of the fibers constituting the textile article, and which further, by the fact of hollow fibers are structured with a groove formed on the fiber surface, have a superior light-weight feeling and a linen-like dry feeling.

[0002]

Prior art

There is a long history of proposals for hollow fibers for the object of making polyester and nylon, for example, more light-weight. For example, a hollow fiber is proposed in Japanese Kokai Patent Application No. Sho 62[1987]-215032, in which the hollowness ratio is 40% or greater through 90% or less, but although it is possible to achieve weight reduction merely by setting a high hollowness ratio, once this is made into cloth, it is an article with a tactile sensation of powerful velvety smoothness similar to ordinary fibers, and cannot impart a dry feeling.

[0003]

A hollow fiber is proposed in Japanese Kokai Patent Application No. Hei 2[1990]-175916, which aims at improving dye-affinity of a hollow fiber, for which the average hollowness ratio is 5-30%, and the hollowness ratio CV% is 5-50%, but a cloth using said published hollow fiber is not able to solve long-standing problems.

[0004]

On the other hand, [with regards to a hollow fiber that results from] a method for conferring a dry sensation to a hollow fiber, there is for example, a hollow fiber having thickness/thinness is proposed in Japanese Kokai Patent Application No. Sho 62[1987]-133111, and a hollow fiber containing a micropore forming agent that is proposed in Japanese Kokai Patent Application No. Hei 1[1989]-1306672 [1989], but in both cases only something within the range of prior art dry sensation material is obtained, but it is impossible to obtain a cloth having a linen-like dry feeling not existing in the prior art, which is the object of the present invention. With regards to composite hollow fibers, a method for obtaining an extremely thin hollow fiber is proposed in Japanese Kokai Patent Application No. Sho 52[1979]-88620, for example, in which non-mutually soluble 2-ingredient polymers are positioned so as to alternate radially, and partitioned. Nevertheless, a cloth using the composite hollow fiber obtained by said publication is not able to impart a dry feeling, and there is almost no weight reduction effect, even though a peach touch handle and drape is obtained.

[0005]

A polygonal-shaped hollow fiber is proposed in Japanese Kokai Patent Application No. Hei 3[1991]-124807, by complete dissolution [and] removal of a sheath component of a core-sheath type composite hollow fiber. [The technique for obtaining] a hollow fiber according to said report is able to improve the dry sensation by making the shape polygonal and also [to obtain] a light-weight feeling by hollowing, but is not able to confer a linen-like dry feeling not existing in the prior art.

[0006]

Accordingly, the prior art is not able to confer a linen-like dry feeling, while at the same time sufficiently conferring a light-weight feeling.

[0007]

Problems to be solved by the invention

The object of the present invention is to offer a cloth that has a linen-like dry feeling not existing in the prior art, while at the same time having a light-weight feeling, which could not be achieved by the aforementioned prior art or combinations thereof.

[0008]

Means to solve the problem

The object of the present invention is a polyester textile article, being a textile article comprising a polyester fiber, characterized by the fact that a hollow fiber that satisfies (1)-(3) below is included so as to constitute 30% by weight or more of a textile article.

(1) The maximum hollowness rate is 40% or less, and the difference between the maximum hollowness rate and the minimum hollowness rate is 7% or more.

(2) The average degree of difference in fiber cross-section is 1.5 or more, and is randomly distributed.

[0009]

(3) Grooves are formed on the fiber surface.

[0010]

The invention is explained in greater detail below. The invented polyester textile article (hereunder referred to as the "textile article") requires that said textile article be structured by the use of at least 30% by weight or more of a hollow fiber, in order to confer a light-weight feeling and suitable drape stiffness/anti-drape stiffness. If no hollow fibers are included, then it will be impossible to impart a light-weight feeling, it will be impossible to impart a suitable drape stiffness/anti-drape stiffness when [the invented fiber] is made into cloth, and [the properties thus] will be insufficient to use [the obtained cloth] in as a cloth for high-class apparel.

[0011]

Therefore, [the content of hollow fiber in the fibers] comprising the invented textile article must be at least 30% by weight or greater, but it is also required that they be hollow fibers having a maximum hollowness ratio of 40% or less. The higher the hollowness ratio, the more preferable, but if the hollowness ratio exceeds a maximum hollowness ratio of 40%, the article quality will degrade, for example the color expression properties may decrease, or fibrillation may occur due to partial /3
rupturing, thus it is necessary for the maximum hollowness ratio to be 40% or less

[0012]

Note that the hollowness ratio is a percentage expression of the ratio of the surface area of the hollow section against the total of the hollow area section surface area plus the cross-section area of the hollow fiber.

[0013]

With regards to the aforementioned hollow fiber hollowness ratio, it is necessary that the difference between the maximum hollowness rate and the minimum hollowness rate be 7% or greater, in order to confer a natural feeling while at the same time conferring a light-weight feeling. This fact, in other words, means that the hollowness ratio is distributed randomly between single fibers, and a natural clumping feeling can be conferred because the difference between the maximum hollowness rate and the minimum hollowness rate is 7% or greater. In a case where the difference between the maximum hollowness rate and the minimum hollowness rate is less than 7%, this effect is not expressed.

[0014]

The maximum hollowness rate and the minimum hollowness rate are determined by taking a multi-filament containing hollow fiber constituting a textile article, measuring the hollowness ratio of individual single fibers from cross-section photographs of hollow fibers, and then determining the maximum hollowness rate and minimum hollowness rate.

[0015]

Said hollow fiber is a hollow fiber having a maximum hollowness rate of 40% or less, and a difference in the range of 7% or greater between the maximum hollowness rate and minimum hollowness rate, but it is acceptable for there to be parts where the hollowness ratio is 0% [in that] part, in other words, portions where the hollow portion is completely broken may be present.

[0016]

It is also required that the hollow fibers constituting the invented textile article have a differentiated fiber cross-section, and it is required for the average differentiation degree at this time to be 1.5 or greater. Namely, the differentiation of the fiber cross-section make it possible to express a natural clumping feeling. In order to express this effect, the average hollow cross-section difference degree must be 1.5 or greater, preferably 2.0 or greater. If the average degree of difference is less than 1.5, it will be impossible to express a superior natural clumping feeling.

[0017]

Nevertheless, if the average hollow cross-section difference degree is too high, the effect of expressing a natural clumping feeling will also be high; but making the degree of difference too high causes fibrillation to occur due to partial rupture of the hollow sections, which lowers the quality of the article, thus it is preferred that the average fiber cross-section degree of difference be 10 or less, and 7 or less is even more preferable.

[0018]

In order to confer a natural clumping feeling and at the same time to confer a linen-like dry feeling not existing in the prior art, it is necessary that the hollow fiber cross-section difference degree vary randomly between single fibers as well as longitudinally within a single fiber. In other words, it is possible, by randomly distributing the fiber cross-section difference degree between single fibers as well as longitudinally within a single fiber, to confer a natural clumping feeling and at the same time to confer a linen-like dry feeling not existing in the prior art. In cases where there is practically no degree of difference in fiber cross-section, this type of effect is not expressed.

[0019]

The degree of difference in fiber cross-section is expressed as the ratio of the circumscribed circle diameter to the maximum inscribed circle diameter of the fiber cross-section, and is determined by taking a multi-filament containing hollow fiber constituting a textile article, and calculating the average degree of difference from the degrees of difference of individual single fibers, of the hollow fibers in a cross-section photograph.

[0020]

A random distribution of fiber cross-section difference degree refers to the facts that the difference between the maximum value and minimum value of the degree of difference, when the aforementioned fiber cross-section difference degree is measured, is 0.1 or greater, preferably 0.5 or greater, and that the distribution of the average degree of difference also differs in the longitudinal direction.

[0021]

It is required that a hollow fiber constituting the invented textile article be formed with a groove on the fiber surface, in order to confer a good, novel linen-like dry feeling; it is also desirable for grooves formed on the fiber surface to be formed such that filamentous grooves are formed in a ratio of 5 or more when groove length is compared to groove width. In other words, the formation of grooves on the fiber surface makes it possible to express a novel linen-like dry feeling not obtainable by prior art hollow yarns.

[0022]

A filamentous groove having a ratio of 5 or more of groove length to groove width is a preferred groove shape for the purpose of expressing a novel linen-like dry feeling; when the ratio of groove length to groove width is less than 5, it becomes impossible for a novel linen-like dry feeling to be expressed due to fabrication, and a limit is imposed on the conditions under which the effect of the invention is obtained. It is preferred that the ratio of groove length to groove width be 7 or greater.

[0023]

In the present invention, "groove" includes a fine pore that has been formed by the prior addition of a fine particle to a polymer, for example, and the removal of said additive fine particle, for example, by a weight reduction process; as long as indentations and projections are formed on the fiber surface, they may have any shape whatsoever.

[0024]

It is preferred that, in order to confer an even better linen-like dry feeling, the groove formed on the fiber surface be a lateral groove perpendicular to the fiber axis. In the present invention, "lateral groove" refers to a groove that has been formed where the longitudinal axis of the groove forms an angle with the fiber axis in a range from 60° to 120°; and it is preferred that 50% or more of the grooves formed on the fiber surface be lateral grooves conforming to the aforementioned range, in order to express a novel linen-like dry feeling.

[0025]

It is also preferred that the frequency of grooves formed on the fiber surface be 1 groove/$(\mu m)^2$ or greater and 5 grooves/$(\mu m)^2$ or less, in order to confer a good, novel linen-like dry feeling. More specifically, if the number of grooves formed on the fiber surface is less than 1 groove/$(\mu m)^2$, the number of grooves formed on the fiber surface will be too small, so it will be impossible to adequately confer a good, novel linen-like dry feeling. If the number of grooves formed on the fiber surface exceeds 5 grooves/$(\mu m)^2$, it will be possible to confer a novel linen-like dry feeling, but other problems will arise pertaining to the properties of the fabric [when used] under practical conditions, such as chafing and fibrillation, for example, reducing the product quality. Accordingly, it is preferred that the frequency of grooves formed on the fiber surface be 1 groove/$(\mu m)^2$ or greater and 5 grooves/$(\mu m)^2$ or less. Note that the groove count is determined from an electromicroscope photograph (5000x or greater) /4
of a fiber surface, the number of grooves within the range of 5 μm x 5 μm is counted in 10 [different] places, and the average value per 1 $(\mu m)^2$ is calculated.

[0026]

It is even more preferable that the hollow fibers constituting the invented textile article be core-sheath type composite hollow fibers. Specifically, a hollow fiber may have the aforementioned specified grooves, and because of these grooves is able to express a novel linen-like dry feeling, but in some cases [the aforementioned grooves] invite a degradation of tearing strength when [said fibers are made] into a fabric, depending on such things as whether strength is lowered. Accordingly, core-sheath type composite hollow fibers are more preferable in order to prevent strength reduction [while at the same time expressing] a novel linen-like dry feeling.

[0027]

The "core-sheath type composite hollow fiber" referred to here is a composite hollow fiber comprising a core component having a hollow section and a sheath component that envelops the core component; it is composited because the core component mainly [functions to] prevent the loss of strength, and the sheath component mainly [functions to] express a novel linen-like dry feeling due to the formation of grooves.

[0028]

Accordingly, in a case where the aforementioned core-sheath type composite hollow fiber is used for 30% by weight or more of the invented textile article, it is preferred that a weight reduction process be conducted [in a controlled fashion] so as to cause some sheath component to be left over from the weight reduction process. The specific reason for this is that, if the sheath component is completely removed during a weight reduction process, the grooves that depend on the sheath component will not be formed, so the novel linen-like dry feeling will not be sufficiently expressed.

[0029]

Based upon the above facts, it is preferred that the aforementioned core-sheath type composite hollow fiber be such that the proportion of core component in the composite ranges from 20% by weight or more through 80% by weight or less. If the proportion of core component in the composite is less than 20% by weight, the effect of preventing strength reduction will be inadequate. Conversely, if the proportion of core component in the composite exceeds 80% by weight, it will be difficult to control the weight reduction process so as to cause some sheath component to be left over from the weight reduction process.

[0030]

It is also desirable, in the matter of subjecting the aforementioned core-sheath type composite hollow fiber to a weight reduction process so as to cause some sheath component to be left over from the weight reduction process, [to control this process in a way that] exposes parts of the core component on the fiber surface, in 1 or more places, along a cross-section of the fiber. More specifically, it is meaningful to cause a mixed presence on the fiber surface of core component and sheath component having the specified grooves; and by [controlling the weight reduction process] and causing this mixed presence of core component and sheath component on the fiber surface, which makes it possible to express a multicolored effect by using different polymers having [different] dye-affinity in the core component and the sheath component, which in turn makes it possible to confer a subtle clumping feeling. It is preferable, in order to further express a subtle clumping feeling, that the core component be exposed on the fiber surface in 3 or more places, along a cross-section of the fiber. The shape of the core component may be any shape whatsoever, as long as it is possible to cause the exposure of the core component prior to complete dissolution and removal of the sheath component.

[0031]

Polyethylene terephthalate and copolymer forms thereof may be mentioned as polymers that can be used in the hollow fiber, of which 30% by weight or more is used in the invented textile article, but the invention is not limited to these. Even in a case where a core-sheath type composite hollow fiber is used for at least 1 part of said polyester textile article, there are no particular limitations on the composite fiber [obtained by] the aforementioned polymer combination, but in terms of preventing strength degradation, it is preferred that the core component be polyethylene terephthalate. For the sheath

component, on the other hand, the use of a copolymer, such as polyethylene terephthalate, for example, copolymerized with 5-sodium sulfoisophthalate, polyethylene glycol, [and/or] isophthalate, for example, is preferred. For example, in a case of a polyethylene terephthalate copolymerized with 5-sodium sulfoisophthalate, the preferred proportion for copolymerization of 5-sodium sulfoisophthalate is 1.5 mole % or more, and 2.2 mole % or more is even more preferable. The upper limit of the copolymerization proportion is preferably below 6 mole %, because it the copolymerization proportion exceeds this, agglutination may occur during processes conducted at particularly high temperatures, such as filiature and dying processes, for example.

[0032]

The invented textile article may be manufactured by the following method, for example. Namely, a hollow fiber or core-sheath type composite hollow fiber is manufactured by methods known to the art, this is [used] along or as a mixed fiber with another fiber, subjected to a fluid process or false twisting process, and this is then woven/knit, thus manufacturing [the article].

[0033]

In a case of fluid processing, namely, a fluid processing nozzle known in the art is used to subject the hollow fiber or core-sheath type composite hollow fiber, either by itself or blended with other fibers, to a fluid process, thereby forming loops and slackening in the thread, followed by a pressurization process using a nip roller at room temperature or heated to 80°C or less, making it possible obtain a fiber with a distribution of hollowness ratios and degrees of difference in fiber cross-section.

[0034]

In the case of a false twisting process, the fact of subjecting the hollow fiber or core-sheath type composite hollow fiber, either by itself or blended with other fibers, to a false twisting process makes it possible to obtain a fiber with a distribution of hollowness ratios and degrees of difference in fiber cross-section. It makes no difference whether the fiber subjected to the false twisting process is drawn yarn or undrawn yarn; if it is undrawn yarn, then the false twisting process may be conducted at the same time as the drawing [operation]. The preferred false twisting process conditions are a false twisting number of 1000 rotations/m or greater, and 3000 rotations/m or less, and a false twisting temperature of 130°C or greater and 200°C or less. It is even more preferable to confer a higher level surface feeling, and for this it is preferred that the false twisting process be conducted after pre-twisting has begun with less than 1000 rotations/m. Namely, by conducting the false twisting process after starting the pre-twisting [operation], because a twisting distribution occurs longitudinally in the false twisting process yarn, it is possible to confer a better surface feeling in the resultant textile article due to said twisting distribution.

[0035]

There are no particular limitations on the weave- and/or knit-textures when the fiber containing a hollow fiber obtained as described above is made into a woven/knit article; it may be woven/knit such that 30% by weight or more of the woven/knit article is the aforementioned hollow fiber.

[0036]

After [the fibers] have been made into a woven article or knit article, it is possible, by conducting a weight reduction treatment with a hot alkali aqueous solution, for example, to form the aforementioned

specified grooves on the fiber surface, thereby conferring a novel linen-like dry feeling, a superior light-weight feeling, drape stiffness/anti-drape stiffness, and a surface feeling, for example.

[0037] /5

With regards to the weight reduction treatment, it does not matter [when in the sequence of] processes it occurs, but in terms of stability it is preferred that it be conduced after weaving or knitting.

[0038]

Application examples

The invention is described in greater detail below with reference to application examples. Values for various properties in the application examples were determined by the following methods.

[0039]

A. Hand properties (dry feeling, light-weight feeling, drape stiffness/anti-drape stiffness, surface feeling)

A functional test, with paired comparison of a test sample with a reference sample, was performed for each parameter, and scored according to a 4-point system. "Extremely superior" was scored with a ◎, "superior" with a ○, normal with a Δ, and "inferior" with an X. As a reference sample, a normal, perennial article was used, made from polyester filament threads having a filament [count] identical to, and fineness identical to the test material thread, and made by the same weaving and finishing processes as the test samples; this [set of baseline data derived from the reference sample] was taken as [the benchmark for] "inferior."

[0040]

B. Fibrillation resistance

[The test was conducted] using a Gakushin-type flat surface abrasion tester for fastness to rubbing testing machine use, and a georgette comprising 100% polyethylene terephthalate was used as an abrading cloth. A test sample was subjected to flat abrasion for 10 minutes under a 500 g load, and fibrillation resistance was scored in a 2-point system, by visual determination of the degree of color difference before and after abrasion. "Superior" was indicated by a ○ and "inferior" by an X. As a reference sample, a normal, perennial article was used, made from polyester filament threads having a filament count identical to, and fineness identical to the test material thread, and made by the same weaving and finishing processes as the test samples; this [set of baseline data derived from the reference sample] was taken as [the benchmark for] "superior."

[0041]

C. Tear strength

[Tear strength] was measured according to JIS L 1096.

[0042]

D. Intrinsic viscosity

[The intrinsic viscosity] was measured using an Ostwald viscosimeter, with 0.1 g of sample dissolved in 10 mL of ortho-chlorophenol, at a temperature of 25°C.

[0043]

E. Hollowness ratio

A cross-section cut of the fiber at thickness 5 μm or less was made, a photograph [of this section] was visually observed, [in order to] measure the area of the fiber cross section of the hollow fiber and the cross section area of its hollow portion. The hollowness ratio of individual single fibers was then calculated as the percentage of the surface area of the hollow section against the total of the hollow area cross-section surface area plus the cross-section area of the hollow fiber.

[0044]

F. Fiber cross-section difference degree

A cross-section cut of the fiber at thickness 5 μm or less was made, a photograph [of this section] was visually observed, [in order to] measure the diameter of the maximum inscribed circle, and the diameter of the circumscribed circle, of the hollow fiber cross section. The degree of difference between individual fibers was calculated as the ratio of the circumscribed circle diameter to the maximum inscribed circle diameter. Then the average difference degree was calculated from the difference degrees of the individual single fibers.

[0045]

Application Examples 1-5 and Comparative Example 1

[A core-sheath type composite hollow fiber was obtained,] having as the core component polyethylene terephthalate containing 2.5% by weight titanium oxide with an intrinsic viscosity [η] of 0.70, and as the sheath component a copolymerized modified polyester with an intrinsic viscosity [η] of 0.50, of 2.0 mole % 5-sodium sulfoisophthalate and 1.0% by weight polyethylene glycol of molecular

weight 4000, discharged at the compositing ratio for core component shown in Table 1, from a mouthpiece-aperture for [forming] hollow fibers comprising a 4-part slit, at a spinning temperature of 290°C, using an ordinary multi-component fiber spinning machine, and wound up on a reel at a rate of 2400 m/min. Undrawn yarn was drawn out 2.0 times by an ordinary hot roll/hot plate drawing machine, giving a 200-denier, 48-filament core-sheath type composite hollow fiber.

[0046]

This core-sheath type composite hollow fiber was then subjected to fluid processing with an ordinary fluid processing nozzle at an air pressure of 5 kg/cm^2, and overfeed rate of 30%. Then it was subjected to forceful pressure treatment by a nip roller heated to 50°C, giving a fluid-processed yarn.

[0047]

A fabric was prepared using this fluid-processed yarn as the warp and weft, and [this intermediate textile] was subjected to a weight reduction treatment using 2% by weight aqueous solution of sodium hydroxide under conditions of 98°C, with other conditions suitably modified, giving a 2/2 twill fabric. The results of evaluating the hollow fiber characteristics and fabric characteristics of the obtained fabric are shown in Table 1.

[0048]

The fabrics obtained in Application Examples 1-3, due to the side groove formed on the fiber surface and the high differentiation of the fiber cross-section, were superior fabrics with a high-class and rich surface feeling, had a novel linen-like dry feeling not existing in the prior art, had superior light-weight feeling, and had good drape stiffness/anti-drape stiffness.

[0049]

In Application Example 4 the amount of sheath component that remained was small, thus the number of grooves formed in the fiber surface was somewhat less, and had slightly inferior dry feeling, although it was still a fabric with superior light-weight feeling, rich surface feeling, and drape stiffness/anti-drape stiffness.

[0050]

In Application Example 5 the sheath component was completely dissolved and removed, yet fine pores were formed on the fiber surface due to additive particles of core component, and although a dry feeling was expressed due to these fine pores, the ratio of groove length to groove width was less than 5, so the dry feeling was slightly inferior, although it was a fabric with superior light-weight feeling, rich surface feeling, and drape stiffness/anti-drape stiffness.

[0051]

On the other hand, in the case of Comparative Example 1, although a novel linen-like dry feeling not existing in the prior art was obtained due to the formation of side grooves on the fiber surface, the fiber cross-section difference degree was approximately uniform, so the dry feeling was inferior.

[0052] /6

TABLE 1

	(1) 実施例1	(2) 実施例2	(3) 実施例3	(4) 実施例4	(5) 実施例5	(6) 比較例1
(7) 芯成分複合比率 (%)	25	50	75	90	90	15
減量率 (%)	19	14	12	7	15	20
芯成分露出箇所 (個)	1	2	4	4	全周 (14)	0
(8) 中空部形状						
最大中空率 (%)	21.5	22.4	25.9	30.5	29.7	13.3
最小中空率 (%)	5.4	4.3	3.9	4.7	4.5	5.8
中空率差*1 (%)	16.1	18.1	22.0	25.8	25.2	7.5
(9) 繊維断面形状						
平均異形度	(15) 3.4	(15) 3.9	(15) 4.7	(15) 6.5	(15) 6.0	(15a) 1.8
ランダム性	ランダム	ランダム	ランダム	ランダム	ランダム	均一
(10) 繊維表面形状						
溝形状	(16) 横溝	(16) 横溝	(16) 横溝	(16) 横溝	(16a) 微細孔	(16) 横溝
溝長さ/溝幅	12.7	13.1	13.5	11.2	2.1	13.7
溝密度 (本/μm²)	4.3	4.2	4.0	0.8	1.1	4.4
(11) 織物特性						
ドライ感	◎	◎	◎	△	△	◎
軽量感	◎	◎	◎	◎	◎	△
張り・腰	◎	◎	◎	◎	◎	△
表面感	◎	◎	◎	◎	◎	×
(12) 織物物性						
耐フィブリル性	○	○	○	○	○	○
引裂強力 (kg)	0.9x3.6	1.1x6.9	1.3x2.9	1.3x1.3	1.2x1.1	0.8x0.7

(13) 注 *1 最大中空率－最小中空率

Key:
1 Application Example 1
2 Application Example 2
3 Application Example 3
4 Application Example 4
5 Application Example 5
6 Comparative Example 1
7 Core component composite ratio (%)
Weight reduction rate (%)
Core component exposure sites (number)
8 Hollow section shape
Maximum hollowness rate (%)

Minimum hollowness rate (%)

Hollowness rate difference*1 (%)

9 Fiber cross-section shape

Average difference degree

Randomness

10 Fiber surface characteristics

Groove shape

Groove length/groove width

Groove frequency (grooves/μm^2)

11 Fabric characteristics

Dry feeling

Light-weight feeling

Drape stiffness/anti-drape stiffness

Surface feeling

12 Fabric properties

Fibrillation resistance

Tear strength (kg)

13 Note *1: Maximum hollowness ratio - minimum hollowness ratio

14 All around

15 Random

15a Uniform

16 Side groove

16a Fine pores

Application Example 6 and Comparative Example 2

A fabric was obtained by a method identical to that of Application Example 4 with the exceptions that: polyethylene terephthalate having an intrinsic viscosity [η] of 0.70 was used as the core component polymer, and a modified polyester having an intrinsic viscosity [η] of 0.57, with addition of 1.5% by weight polyethylene glycol of molecular weight 20,000 was used as the sheath polymer. The hollow fiber characteristics and fabric characteristics of the obtained fabrics were evaluated, and these results are shown in Table 2.

[0053]

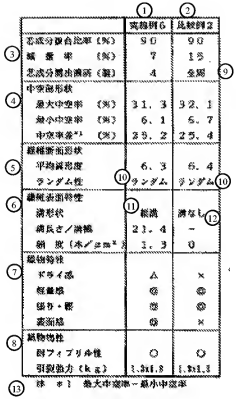
The [fibers forming the] fabric obtained in Application Example 6 had longitudinal grooves from in the fiber surface and little of the sheath component remained, thus the number of grooves that had been formed on the fiber surface was accordingly small; because of this, although the dry feeling was somewhat inferior, the fabric was superior, with superior light-weight feeling, good drape stiffness/anti-drape stiffness, and rich surface feeling.

[0054]

In contrast, in Comparative Example 2, grooves failed to form on the fiber surface because the sheath component had been completely dissolved and removed, and it lacked a superior surface feeling and a novel linen-like dry feeling.

[0055]

TABLE 2



		① 実施例6	② 比較例2
③	芯成分複合比率（%）	90	90
	減量率（%）	7	15
	芯成分露出箇所（箇）	4	全周 ⑨
④	中空部形状		
	最大中空率（%）	31.3	32.1
	最小中空率（%）	6.1	5.7
	中空率差*1（%）	25.2	25.4
⑤	繊維断面形状		
	平均扁平度	6.3	6.4
	ランダム性 ⑩	ランダム	ランダム ⑩
⑥	繊維表面特性		
	溝形状 ⑪	有溝	溝なし ⑫
	溝長さ／繊維長	21.4	-
	紡糸（本／ホール）	3.3	0
⑦	織物特性		
	ドライ感	△	×
	軽量感	◎	◎
	張り・腰	◎	◎
	表面感	◎	×
⑧	織物物性		
	耐フィブリル性	○	○
	引裂強力（kg）	1.3±1.3	1.3±1.3

⑬ 注 *1 最大中空率－最小中空率

Key: 1 Application Example 6

2 Comparative Example 2

3 Core component composite ratio (%)

Weight reduction rate (%)

Core component exposure sites (number)

4 Hollow section shape

Maximum hollowness rate (%)

Minimum hollowness rate (%)

Hollowness rate difference*1 (%)

5 Fiber cross-section shape

	Average difference degree
	Randomness
6	Fiber surface characteristics
	Groove shape
	Groove length/groove width
	Groove frequency (grooves/μm^2)
7	Fabric characteristics
	Dry feeling
	Light-weight feeling
	Drape stiffness/anti-drape stiffness
	Surface feeling
8	Fabric properties
	Fibrillation resistance
	Tear strength (kg)
9	All around
10	Random
11	Longitudinal grooves
12	No grooves
13	Note *1: Maximum hollowness ratio - minimum hollowness ratio

Application Examples 7-10 and Comparative Examples 3-6

Using the polymers shown in Table 3, [yarns were prepared by] discharge from a mouthpiece-aperture for [forming] hollow fibers comprising a 6-part slit, at a spinning temperature of

289°C, using an ordinary spinning machine, and wound up on a reel at a rate of 1600 m/min. Undrawn yarn was drawn out 2.3 times by an ordinary hot roll/hot plate drawing machine, giving a 100-denier, 36-filament hollow fiber.

[0056]

This hollow fiber was doubled with a 100 denier, 48 filament, round-cross-section yarn, prepared from polyethylene terephthalate having intrinsic viscosity [η] of 0.66, and [this was subjected to a fluid /7
treatment] identical to that of Application Example 1, giving a fluid-processed yarn.

[0057]

A fabric was prepared using this fluid-processed yarn as the warp and weft, and [this intermediate fabric] was subjected to a weight reduction treatment using 2% by weight aqueous solution of sodium hydroxide under conditions of 98°C. The results of evaluating the hollow fiber characteristics and fabric characteristics of the obtained fabric are shown in Table 4.

[0058]

The fabrics obtained in Application Examples 7 and 8, due to the side groove formed on the fiber surface and differentiation of the fiber cross-section, were superior fabrics with a high-class and rich surface feeling, had a novel linen-like dry feeling not existing in the prior art, had superior light-weight feeling, and had good drape stiffness/anti-drape stiffness.

[0059]

In Application Example 9 the copolymer amount of the copolymer component was slightly high, therefore the fabric tear strength was slightly lower, and the surface feeling was slightly inferior, yet a fabric rich in suitable drape stiffness/anti-drape stiffness, light-weight feeling, and linen-like dry feeling was obtained.

[0060]

In Application Example 10, fine pores were formed on the fiber surface due to additive particles, and the dry feeling was slightly inferior because the ratio of groove length to groove width was less than 5; even so, it was a fabric with superior light-weight feeling, rich surface feeling, and drape stiffness/anti-drape stiffness.

[0061]

In Comparative Example 3, although a linen-like dry feeling was obtained due to the side grooves formed on the fiber surface, the maximum hollowness ratio was high and the hollow cross-section difference degree was also large, so part of the hollow fiber became fillibrated, and the article quality was low.

[0062]

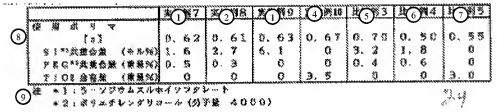
In Comparative Example 4, although a linen-like dry feeling was obtained due to the side grooves formed on the fiber surface, the difference between the maximum hollowness ratio and minimum hollowness ratio was small, so the surface feeling was poor; also, because the hollowness ratio was somewhat low, a sufficient light-weight feeling was not obtained.

[0063]

In Comparative Example 5, the surface feeling was poor because the hollow cross-section difference degree was small, and although fine pores were formed on the fiber surface due to additive particles, the ratio of groove length to groove thickness was less than 5, so the dry feeling was slightly inferior.

[0064]

TABLE 3



使用ポリマ	実施例7	実施例8	実施例9	実施例10	比較例3	比較例4	比較例5
[η]	0.62	0.61	0.63	0.67	0.78	0.50	0.55
SI*1共重合量 (モル%)	1.6	2.7	6.1	0	3.2	1.8	0
PEG*2共重合量 (重量%)	0.5	0.3	0	0	0.4	0.6	0
アルミナ含有量 (重量%)	0	0	0	3.5	0	0	3.0

注 *1：5-ソジウムスルホイソフタレート
*2：ポリエチレングリコール(分子量 4000)

Key: 1 Application Example 7

2 Application Example 8

3 Application Example 9

4 Application Example 10

5 Comparative Example 3

6 Comparative Example 4

7 Comparative Example 5

8 Polymer used

[η]

SI*1 copolymer content (mole %)

PEG*2 copolymer content (weight %)

TiO2 content (weight %)

9 *1: 5-sodium sulfoisophthalate

*2: Polyethylene glycol (molecular weight 4000)

TABLE 4 /8

		(1) 実施例7	(2) 実施例8	(3) 実施例9	(4) 実施例10	(5) 比較例3	(6) 比較例4	(7) 比較例5
(8)	中空繊維比率（重量%）	45	43	44	49	44	47	49
	減量率（%）	12	13	11	15	12	15	13
(9)	中空部形状							
	最大中空率（%）	24.7	32.5	38.6	19.2	42.8	10.2	10.4
	最小中空率（%）	4.9	3.9	2.8	6.3	2.9	4.1	3.1
	中空斑*1（%）	19.8	28.6	35.8	12.9	39.9	6.1	7.4
(10)	繊維断面形状							
	平均異形度	(10a) 6.1	8.3	10.9	3.1	11.6	1.6	1.4
	ランダム性	ランダム	ランダム	ランダム	ランダム	ランダム	ランダム	ランダム
(11)	繊維表面特性	(11a)	(11a)	(11a)	(11b)	(11a)	(11a)	(11b)
	溝形状	横溝	横溝	横溝	微細孔	横溝	横溝	微細孔
	溝長さ／溝幅	5.7	10.5	16.4	2.7	12.3	7.3	2.4
	密度（本/μm²）	1.2	2.4	5.5	3.1	1.9	3.3	3.7
(12)	織物特性							
	ドライ感	◎	◎	◎	△	◎	○	△
	軽量感	◎	◎	◎	◎	◎	×	△
	張り・腰	◎	◎	○	◎	△	○	◎
	表面感	◎	◎	△	○	×	×	×
(13)	織物物性							
	耐フィブリル性	○	○	○	○	×	○	○
	引裂強力（kg）	1.1x1.0	1.0x1.0	0.7x0.8	1.3x1.2	1.8x2.8	1.8x1.2	1.1x1.8

(14) 注 *1 最大中空率－最小中空率

Key: 1 Application Example 7

2 Application Example 8

3 Application Example 9

4 Application Example 10

5 Comparative Example 3

6 Comparative Example 4

7 Comparative Example 5

8	Hollow fiber ratio (weight %)
	Weight reduction rate (%)
9	Hollow section shape
	Maximum hollowness rate (%)
	Minimum hollowness rate (%)
	Hollowness rate difference*1 (%)
10	Fiber cross-section shape
	Average difference degree
	Randomness
10a	Random
11	Fiber surface characteristics
	Groove shape
	Groove length/groove width
	Groove frequency (grooves/μm^2)
11a	Side groove
11b	Fine pores
12	Fabric characteristics
	Dry feeling
	Light-weight feeling
	Drape stiffness/anti-drape stiffness
	Surface feeling
13	Fabric properties
	Fibrillation resistance

Tear strength (kg)

14 Note *1: Maximum hollowness ratio - minimum hollowness ratio

Comparative Example 6

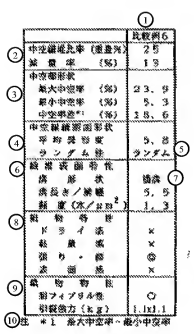
A plain weave fabric was prepared using the fluid-processed yarn obtained in Application Example 7, using as the weft something obtained by real twisting at 2300 rotations/m in a 100 denier, 48 filament, round-cross-section yarn, manufactured of polyethylene terephthalate for which the intrinsic viscosity [η] was 0.66, and subjecting this to a weight reduction treatment using 2% by weight aqueous solution of sodium hydroxide under conditions of 98°C. The results of evaluating the hollow fiber characteristics and fabric characteristics of the obtained fabric are shown in Table 5.

[0065]

The hollow fiber that structures the obtained fabric has a randomly distributed hollowness ratio [and] hollow cross-section difference degree, and side grooves have been formed on the fiber surface, however, due to the low content of hollow fibers (25%), a linen-like dry feeling, light-weight feeling, and surface feeling were not obtained.

[0066]

TABLE 5



Key: 1 Comparative Example 6

2 Hollow fiber ratio (weight %)

Weight reduction rate (%)

3 Hollow section shape

Maximum hollowness rate (%)

Minimum hollowness rate (%)

Hollowness rate difference*1 (%)

4 Hollow fiber cross-section shape

Average difference degree

Randomness

5 Random

6 Fiber surface characteristics

Groove shape

Groove length/groove width

Groove frequency (grooves/μm^2)

7 Side groove

8 Fabric characteristics

Dry feeling

Light-weight feeling

Drape stiffness/anti-drape stiffness

Surface feeling

9 Fabric properties

Fibrillation resistance

Tear strength (kg)

10 Note *1: Maximum hollowness ratio - minimum hollowness ratio

Application Example 11

The core-sheath type composite hollow fiber manufactured in Application Example 3 was given a real twist of 100 rotations/m, and then subjected to false twist process with a false twisting temperature of 170°C and false twist count of 2000 rotations/m, giving a false-twist processed yarn.

[0067]

A plain weave fabric was prepared using the false-twist processed yarn, using as the weft something obtained by real twisting at 2300 rotations/m in a 100 denier, 48 filament, round-cross-section yarn, manufactured of polyethylene terephthalate for which the intrinsic viscosity [η] was 0.66, and subjecting

this to a weight reduction treatment using 2% by weight aqueous solution of sodium hydroxide under conditions of 98°C. The results of evaluating the hollow fiber characteristics and fabric characteristics of the obtained fabric are shown in Table 6.

[0068]

The fabric obtained for Application Example 11 has side grooves formed in the fiber surface and differentiation of the fiber cross-section, thus it is a superior fabric having a high-class, rich surface /9
feeling, with a novel linen-like dry feeling not existing in the prior art, superior light-weight feeling, and good drape stiffness/anti-drape stiffness.

[0069]

TABLE 6

	① 実施例11
① 中空繊維混率（重量%）	67
収縮率（%）	15
易溶成分溶出時間（分）	4
① 中空部形状	
最大中空率（%）	26.5
最小中空率（%）	4.9
中空率差*1（%）	21.6
① 中空繊維断面形状	
平均異形度	5.9
ランダム性	ランダム ①
① 繊維表面特性	
溝形状	線溝 ①
溝長さ／繊維径	14.3
密度（本／μm²）	4.4
① 織物特性	
ドライ感	◎
軽量感	◎
張り・腰	◎
表面感	◎
① 織物物性	
耐フィブリル性	○
引裂強力（kg）	1.3×1.1

① 注 *1 最大中空率－最小中空率

Key: 1 Application Example 11

2	Hollow fiber ratio (weight %)
	Weight reduction rate (%)
	Core component exposure sites (number)
3	Hollow section shape
	Maximum hollowness rate (%)
	Minimum hollowness rate (%)
	Hollowness rate difference*1 (%)
4	Hollow fiber cross-section shape
	Average difference degree
	Randomness
5	Random
6	Fiber surface characteristics
	Groove shape
	Groove length/groove width
	Frequency (grooves/μm^2)
7	Side grooves
8	Fabric characteristics
	Dry feeling
	Light-weight feeling
	Drape stiffness/anti-drape stiffness
	Surface feeling
9	Fabric properties
	Fibrillation resistance

Tear strength (kg)

Note *1: Maximum hollowness ratio - minimum hollowness ratio

[0070]

Effect of the invention

The invented polyester textile article is constituted of hollow fibers such that at least 30% by weight or more [of the hollow fibers] constituting said textile article have a randomly distributed hollowness ratio and hollow cross-section difference degree, and are further formed with a specified groove on the fiber surface, which makes it possible to obtain a cloth with a high-class, rich surface feeling, drape stiffness/anti-drape stiffness, with a linen-like dry feeling not existing in the prior art, and superior light-weight feeling.